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PART XIV

## AIRCRAFT GROUND-FLOTATION INVESTIGATION

### PART XIV — DATA REPORT ON TEST SECTION 14

*J. WATKINS and G. HAMMITT II*

*U. S. ARMY ENGINEER WATERWAYS EXPERIMENT STATION*

TECHNICAL REPORT AFFDL-TR-66-43, PART XIV

SEPTEMBER 1966

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AIR FORCE FLIGHT DYNAMICS LABORATORY  
RESEARCH AND TECHNOLOGY DIVISION  
AIR FORCE SYSTEMS COMMAND  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

# **AIRCRAFT GROUND-FLotation INVESTIGATION**

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*J. WATKINS and G. HAMMITT II*

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## FOREWORD

This report was prepared by Battelle Memorial Institute of Columbus, Ohio, on Air Force Contract No. AF 33(615)-2532, under Task No. 822203 of Project No. 8222, "Continuation of the Small-Scale Operation of a Transducer Information Center". The work was administered under the direction of the AF Flight Dynamics Laboratory, Research and Technology Division, W. G. James (FDCL) was the project engineer for the Laboratory. The assistance provided during the course of this program by Mr. James, H. Snowball, D. Shumway, Dr. Paul Polishuk, and others at the Laboratory is gratefully acknowledged.

The activities discussed in this report began on February 1, 1965, and were concluded on February 1, 1966. Thus, two 30-day periods of activities under the previous Contract No. AF 33(615)-1819 were not reported in AFFDL-TR-65-30 and are included in this report. W. E. Chapin, with the assistance of C. L. Hanks, H. T. Gruber, and E. N. Wylor, has overall technical responsibility for these research activities. W. H. Veazie and G. L. McCann managed for the various phases of information research and the management of the small-scale information-center operations. This report was submitted for distribution on April 1, 1966.

This is the final report; it summarizes work performed in determining implementation techniques and studies of feasibility for their application in the operation of a small-scale transducer information center (TIC).

The authors wish to acknowledge assistance and cooperation so generously provided by researchers, users, and manufacturers of transducers, who promptly responded by completing and forwarding information forms and reports on their research activities and who supplied information on their new product developments. The assistance provided by the various groups of the Instrument Society of America, the Chemical Propulsion Information Agency, and the research scientists of the National Bureau of Standards at Washington, D. C., and Boulder, Colorado, is also greatly appreciated.

Publication of this technical report does not constitute Air Force approval of the report's finding or conclusions contained herein. It is published only for the exchange and stimulation of ideas.



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## ABSTRACT

This data report describes work undertaken as part of an overall program to develop ground-flotation criteria for the C-5A aircraft. A test section was constructed to a width adequate for two test lanes. The test lanes were unsurfaced and each lane was divided into three items having different subgrade CBR values. Traffic was applied to one lane using a 12-wheel (4 abreast, 3 in line) tracking assembly with 100-psi tire inflation pressure and 252,000-lb loading (21,000 lb per tire). The wheel assembly consisted of twelve 20.00-20, 22-ply aircraft tires. On the other lane, a single-wheel tracking assembly (loaded to 21,000 lb) consisting of a single 20.00-20, 22-ply aircraft tire with 100-psi inflation pressure was used.

The information reported herein includes layout of the test lanes, characteristics and print dimensions of the load assembly tires, and data collected on soil strengths, surface deformations and deflections, and drawbar pull. The traffic-coverage level is given at which each test item was considered failed.

## CONTENTS

	<u>Page</u>
SECTION I: INTRODUCTION. . . . .	1
SECTION II: DESCRIPTION OF TEST SECTION AND LOAD VEHICLES . . . . .	2
Description of Test Section. . . . .	2
Load Vehicles. . . . .	2
SECTION III: APPLICATION OF TRAFFIC, FAILURE CRITERIA, AND DATA COLLECTED . . . . .	3
Application of Traffic . . . . .	3
Failure Criteria and Data Collected. . . . .	3
SECTION IV: BEHAVIOR OF ITEMS UNDER TRAFFIC AND TEST RESULTS. . . . .	5
Lane 30. . . . .	5
Lane 31. . . . .	7
SECTION V: PRINCIPAL FINDINGS . . . . .	9

## ILLUSTRATIONS AND TABLES

<u>Figure</u>	<u>Page</u>
1. Traffic distribution patterns for Test Section 14	3
2. Test load vehicle used in trafficking lane 30	13
3. Test load vehicle used in trafficking lane 31	13
4. Lane 30, item 1, prior to traffic	14
5. Lane 30, item 1. Transverse straightedge shows rutting at 2.4 coverages (2 passes) (failure)	14
6. Lane 30, item 2, prior to traffic	15
7. Lane 30, item 2. Transverse straightedge shows roughness at 28 coverages (failure)	15
8. Lane 30, item 3, prior to traffic	16
9. Lane 30, item 3. Transverse straightedge shows roughness at 730 coverages (failure)	16
10. Lane 31, item 1. Transverse straightedge shows roughness at 3 coverages (failure)	17
11. Lane 31, item 2. Transverse straightedge shows roughness at 26 coverages (failure)	17
12. Lane 31, item 3. Transverse straightedge shows roughness at 40 coverages (failure)	18
13. Layout of Test Section 14 and summary of test results	19
14. Tire-print dimensions and tire characteristics	20
15. Cross-sectional deformations, Test Section 14, lane 30	21
16. Cross-sectional deformations, Test Section 14, lane 31	22
17. Permanent profile deformations	23

<u>Table</u>	
1. Summary of Traffic Data, Test Section 14	11
2. Summary of CBR, Density, and Water Content Data, Test Section 14	12

## SUMMARY

Tests on Section 14 are one phase of a comprehensive research program to develop ground-flotation criteria for heavy cargo-type aircraft. Section 14 consisted of two similar unsurfaced traffic lanes, lanes 30 and 31, each of which was divided into three items having different subgrade CBR values (figure 13).

Traffic was applied to lane 30 using a 12-wheel (4 abreast, 3 in line) tracking assembly with 100-psi tire inflation pressure and 252,000-lb loading (21,000 lb per wheel); in lane 31, a single-wheel assembly with 100-psi tire inflation pressure and 21,000-lb loading was used. For trafficking lane 30, the wheel assembly consisted of twelve 20.00-20, 22-ply aircraft tires spaced 30.25-34.75-30.25 in. abreast and 123-123 in. in tandem. For trafficking lane 31, one 20.00-20, 22-ply aircraft tire was used. Figure 14 gives pertinent tire-print dimensions and tire characteristics.

The lanes were trafficked to failure in accordance with the criteria designated in Part I of this report. Data were recorded throughout testing to give a behavior history of each item. Using the test criteria mentioned above, it was possible to directly compare the effects of trafficking with the two assemblies. Basic performance data are summarized in the following paragraphs.

### Lane 30

#### Item 1

The item was considered failed due to severe rutting at 2.4 coverages (2 passes) of the load vehicle. The rated CBR of the item was 3.8.

#### Item 2

The item was considered failed due to roughness at 28 coverages. The rated CBR of the item was 6.1.



Item 3

The item was considered failed due to roughness at 730 coverages.  
The rated CBR of the item was 10.0.

Lane 31

Item 1

The item was considered failed due to roughness at 3 coverages.  
The rated CBR of the item was 4.2.

Item 2

The item was considered failed due to roughness at 26 coverages.  
The rated CBR of the item was 6.3.

Item 3

The item was considered failed due to roughness at 40 coverages.  
The rated CBR of the item was 7.5.

## AIRCRAFT GROUND-FLOTATION INVESTIGATION

### PART XIV DATA REPORT ON TEST SECTION 14

#### SECTION I: INTRODUCTION

The investigation reported herein is one phase of a comprehensive research program being conducted at the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss., as part of the U. S. Air Force Project No. 410-A, MIPR No. AS-4-177, to develop ground-flotation criteria for the C-5A, a heavy cargo-type aircraft. Specifically, the tests reported herein were conducted to compare the effects of trafficking with a multiwheel landing-gear assembly and a single-wheel landing-gear assembly having the same load per tire.

Prosecution of this investigation consisted of constructing two similar traffic lanes and subjecting them to traffic with a 12-wheel assembly and a single-wheel assembly having the same load per tire.

This report presents a description of the test section and wheel assemblies and gives results of trafficking. Equipment used, types of data and method of recording them, and general test criteria are summarized in this part with more complete explanations and illustrations appearing in Part I of this report.

## SECTION II: DESCRIPTION OF TEST SECTION AND LOAD VEHICLES

### Description of Test Section

Test Section 14 (figure 13) was constructed within a roofed area in order to allow control of the subgrade CBR (California Bearing Ratio) in the test items. Section 14 was located on the same site as prior Test Sections 6, 4, and 2 in this series. The construction of Test Section 2 is described in Part III of this report. The underlying subgrade was undisturbed by prior tests on the site so that in construction of Section 14 only the upper 24 in. of soil was excavated. The surface exposed by excavation was scarified and recompactd before backfilling the area in four compacted lifts with a heavy clay soil (buckshot; classified as CH according to the Unified Soil Classification System, MIL-STD-619). The fill material used was a local clay with a plastic limit of 27, liquid limit of 58, and plasticity index of 31. Gradation and classification data for the subgrade material are given in Part I.

Two unsurfaced traffic lanes, each divided into three items, were constructed in the test section. Different subgrade strengths were obtained in the items (figure 13) by controlling the water content and compaction effort.

### Load Vehicles

The multiwheel load vehicle used in trafficking lane 30 is shown in figure 2. This vehicle consists of an electrically powered prime mover with three load carts. The load carts are attached to the prime mover by a torsion bar, and to each other by parallel bars that maintain horizontal stability while allowing the load carts to oscillate vertically. The test load was 21,000 lb per wheel (a total load of 252,000 lb). The wheel assembly consisted of twelve 20.00-20, 22-ply aircraft tires inflated to a pressure of 100 psi. Typical tire-contact-area dimensions, overall assembly dimensions, and pertinent tire characteristics are shown in figure 14.

The total test load designated for lane 31 was 21,000 lb. The wheel assembly (figure 3) consisted of a 20.00-20, 22-ply aircraft tire with 100-psi inflation pressure. Tire-print data and pertinent tire characteristics are shown in figure 14.

### SECTION III: APPLICATION OF TRAFFIC, FAILURE CRITERIA, AND DATA COLLECTED

#### Application of Traffic

Traffic was applied to the test lanes in a nonuniform pattern with intensity of traffic being varied within each lane to produce approximately the bell-shaped traffic distribution curve which results from the wander of aircraft from the lane center line. In lane 30, the multiwheel traffic was distributed across the lane width in four zones of about 100, 90, 50, and 20 percent traffic coverage (figure 1). In lane 31, the single-wheel traffic was distributed across the lane width in three zones of about 100, 80, and 20 percent traffic coverage (figure 1). The coverage levels referred to in the tables and text herein are the total number of coverages applied to the 100 percent coverage zone. The corresponding number of coverages applied to the outer traffic zones is proportional to the percentage factor for the respective zones, as shown in figure 1.

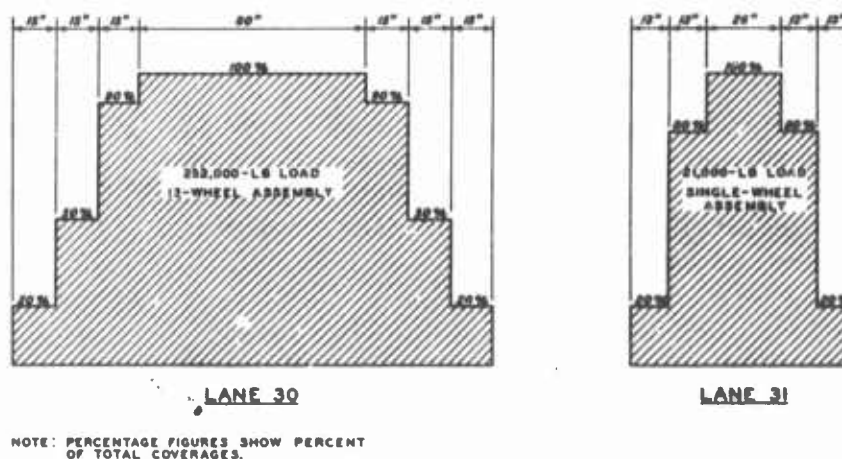


Figure 1. Traffic distribution patterns for Test Section 14

#### Failure Criteria and Data Collected

Failure criteria used in this investigation and descriptive terms used in presentation and discussion of data in all parts in this report are presented in Part I. A general outline of types of data collected is given in the following paragraphs. Details on apparatus and procedure for obtaining specific measurements are given in Part I.

#### CBR, water content, and dry density

CBR, water content, and dry density of the subgrade were measured for each test item prior to application of traffic, at intermediate

coverage levels, and at failure. After traffic was concluded on an item, a measure of subgrade strength termed "rated CBR" was determined. Rated CBR is generally the average CBR value obtained from all the determinations made in the top 12 in. of soil during the test life of an item. In certain instances, extreme or irregular values may be ignored if the analyst decides that they are not properly representative.

#### Surface roughness, or differential deformation

Surface roughness, or differential deformation, measurements were made using a 10-ft straightedge at various traffic-coverage levels on all items. Rut depths were also measured.

#### Deformations

Deformations, defined as permanent cumulative surface changes in cross section or profile of an item, were charted by means of level readings at pertinent traffic-coverage levels.

#### Deflection

Deflection of the test surface under an individual static load of the tracking assembly was measured at various traffic-coverage levels on each item. A pin and cap device directly beneath a load wheel provided deflection data. Both total (for a single loading) and elastic (recoverable) deflections were measured.

#### Rolling resistance

Rolling resistance, or drawbar pull, measurements were performed with the load vehicle over each test item at designated coverage levels. Two types of drawbar measurements were taken on lane 30: (a) average force required to maintain a constant speed once the load vehicle is in motion, termed "rolling DBP"; and (b) maximum force obtained during the constant speed run, termed "peak DBP." On lane 31, only rolling DBP was measured.

## SECTION IV: BEHAVIOR OF ITEMS UNDER TRAFFIC AND TEST RESULTS

### Lane 30

#### Behavior of items under traffic

Item 1. Figure 4 shows item 1 prior to traffic. After 2.4 coverages (2 passes) the item was severely rutted and considered failed (figure 5). After failure the item was leveled and surfaced with M9 landing mat in order to continue trafficking the remaining items in the test lane. The rated CBR of the item was 3.8.

Item 2. Figure 6 shows item 2 prior to traffic. After 28 coverages the item was considered failed due to rutting (figure 7). After failure the item was leveled and surfaced with M9 landing mat in order to continue trafficking the remaining item in the test lane. The rated CBR of the item was 6.1.

Item 3. Figure 8 shows item 3 prior to traffic. At 487 coverages considerable differential deformation had occurred and surface cracks were noticeable. Traffic was continued to 730 coverages at which point the item was considered failed (figure 9). The rated CBR of the item was 10.

#### Test results

Results of trafficking lane 30 are summarized in table 1. Soil test data are given in table 2.

Item 1. Item 1 was considered failed at 2 passes of the load vehicle. The following information was obtained from traffic tests on item 1.

- a. Roughness. Differential deformations and rutting were very severe after 2 passes of the load vehicle (table 1). Average transverse and diagonal differential deformations were 7.87 and 8.72 in., respectively. The average rut depth at failure was 7.85 in.
- b. Deformations. Cross-sectional deformations at 2 passes are shown in figure 15 for four locations along the item. The severity of rutting is evident in the plots with some ridges of soil from 4 to 6 in. high. A profile along the item at 2 passes (figure 17) shows greatest settlement in the first 25 ft of the item.
- c. Deflection. Average total subgrade deflection and average elastic subgrade deflection under a single pass of the load cart were unchanged with traffic, measuring 2.40 in. and 0.50 in., respectively (table 1).
- d. Rolling resistance. Peak and rolling drawbar pull values were

27.4 and 28.3 kips, respectively, at 2 passes (table 1).

Item 2. Item 2 was considered failed at 28 coverages. The following information was obtained from traffic tests on item 2.

- a. Roughness. Average transverse and diagonal differential deformations and average rut depths were approximately the same at failure, measuring 5.35, 5.56, and 5.35 in., respectively (table 1).
- b. Deformations. Cross-section deformations at 2 passes and at 28 coverages are shown in figure 15 for four locations along the item. Considerable increase in deformations is evident between the traffic levels represented. The profile shown in figure 17 illustrates a corresponding increase in settlement along the item.
- c. Deflection. Average total subgrade deflection and average elastic subgrade deflection under a single pass of the load cart were measured prior to traffic and at 28 coverages (table 1). Average total deflection increased from 1.4 to 2.2 in. with traffic while average elastic deflection increased from 0.40 to 0.50 in.
- d. Rolling resistance. Drawbar pull values measured at 2 passes and at 28 coverages showed only small changes (table 1). Peak drawbar pull increased slightly from 16.4 to 16.8 kips and rolling drawbar pull decreased from 14.4 to 13.4 kips.

Item 3. Item 3 was considered failed at 730 coverages. The following information was obtained from traffic tests on item 3.

- a. Roughness. Progressively increasing roughness of the test item is evident in the differential deformation and rutting measurements shown in table 1. Average transverse and diagonal differential deformations were 3.19 and 3.15 in., respectively, at failure, while average rut depths were only 2.50 in.
- b. Deformations. Cross-section deformations in figure 15 show the good condition of the item at 28 coverages and the deteriorated condition at failure. The profile deformation in figure 17 particularly illustrates the difference in settlement between 28 and 730 coverages.
- c. Deflection. Average total and elastic deflections under a single pass of the load cart for a number of coverage levels are rather erratic (see table 1). Both average total and average elastic subgrade deflections showed decreases at 730 coverages when compared with the preceding measurements at 608 coverages.
- d. Rolling resistance. Drawbar pull values, shown in table 1, were

inconsistent with coverage levels, and at 730 coverages both peak and rolling drawbar pull showed net decreases from initial values.

### Lane 31

#### Behavior of items under traffic

Item 1. Item 1 prior to traffic was similar in appearance to the item shown in figure 4. The item rutted severely under traffic and at 3 coverages was considered failed (figure 10). The rated CBR for the item was 4.2.

Item 2. Item 2 prior to traffic was similar in appearance to the item shown in figure 6. Considerable rutting with initial application of traffic was observed, but traffic was continued to 26 coverages at which time the item was considered failed due to roughness (figure 11). The rated CBR for the item was 6.3.

Item 3. Item 3 prior to traffic was similar in appearance to the item shown in figure 8. When data were recorded at 26 coverages, the item surface was considerably rutted and had prominent surface cracks. At 40 coverages the item was considered failed due to roughness (figure 12). The rated CBR for the item was 7.5.

#### Test results

Results on trafficking lane 31 are summarized in table 1. Soil test data are given in table 2.

Item 1. Item 1 was considered failed at 3 coverages. The following information was obtained from traffic tests on item 1.

- a. Roughness. Differential deformations and rutting measurements (table 1) indicate the severe roughness of the item surface at 3 coverages. Average transverse and diagonal differential deformations were 4.90 and 5.10 in., respectively, at failure, while average rut depth was 4.37 in.
- b. Deformations. Cross-section deformations (figure 16) show the severely rutted surface at 3 coverages. Figure 17, showing profile deformations at 3 coverages, further illustrates the general settlement that occurred along the item.
- c. Deflection. Average total and average elastic subgrade deflections under a single pass of the load cart showed decreases with traffic (table 1). Average total deflection was 2.7 in. and 1.2 in. at 0 and 3 coverages, respectively, while average elastic deflection decreased slightly from 0.9 to 0.7 in.



- d. Rolling resistance. The rolling drawbar pull value of 2.4 kips at 0 coverages was unchanged with traffic (table 1).

Item 2. Item 2 was considered failed at 26 coverages. The following information was obtained from traffic tests on item 2.

- a. Roughness. Differential deformations and rut depths are shown in table 1 for 3 and 26 coverages. At failure the average transverse and diagonal differential deformations (5.87 and 6.12 in., respectively) greatly exceeded average rut depths (3.06 in.). Longitudinal differential deformations were comparatively large at 26 coverages, averaging 1.06 in.
- b. Deformations. Cross-section deformations at three locations along the item are shown in figure 16 for 3 and 26 coverages. Figure 17 shows profile deformations along the item and illustrates the general subsidence of the item and progressively increasing longitudinal roughness.
- c. Deflection. Subgrade deflections under a single pass of the load cart are shown in table 1 for several coverage levels. The average elastic subgrade deflection increased with traffic from 0.4 to 0.7 in. and average total subgrade deflection was 0.9 in. both at 0 coverages and at 26 coverages with a slightly lower value of 0.7 in. at 3 coverages.
- d. Rolling resistance. Rolling drawbar pull increased rather consistently with traffic, registering 1.3, 1.4, and 2.3 kips at 0, 3, and 26 coverages, respectively.

Item 3. Item 3 was considered failed at 40 coverages. The following information was obtained from traffic tests on item 3.

- a. Roughness. Differential deformations and rut depths, shown in table 1, increased steadily with traffic. Average transverse and diagonal differential deformations of 5.44 and 4.72 in., respectively, exceeded average rut depth of 2.38 in. at 40 coverages.
- b. Deformations. Cross-section deformations in figure 16 show the progressive deterioration of the item at 3, 26, and 40 coverages. For the same coverage levels, figure 17 shows profile deformations with corresponding indications of settlement and deterioration.
- c. Deflection. Subgrade deflections under a single pass of the load cart at several coverage levels showed rather erratic values with only slight changes between values at 0 and 40 coverages (table 1).
- d. Rolling resistance. Rolling drawbar pull was slightly greater at 40 coverages than at 0 coverages (1.1 and 0.9 kips, respectively) but showed some decrease from the 26-coverage value of 1.3 kips.

## SECTION V: PRINCIPAL FINDINGS

From the foregoing discussion, the principal findings relating test load, wheel assembly, tire inflation pressure, subgrade CBR, and traffic coverages are as follows:

<u>Load, Wheel Assembly, and Tire Pressure</u>	<u>Item No.</u>	<u>Rated Subgrade CBR</u>	<u>Coverages at Failure</u>
<u>Lane 30</u>			
252,000-lb load; 12-wheel assembly; 20.00-20, 22- ply tires at 100-psi in- flation pressure	1	3.8	2.4 (2 passes)
	2	6.1	28
	3	10.0	730
<u>Lane 31</u>			
21,000-lb load; single- wheel assembly; 20.00-20, 22-ply tire at 100-psi inflation pressure	1	4.2	3
	2	6.3	26
	3	7.5	40

TABLE 1

## SUMMARY OF TRAFFIC DATA, TEST SECTION 14

Test Item	Coverages	Rated CBR	Differential Deformations (in.)						Rutting (in.)		Drawbar Pull (kips)		Average Total Subgrade Deflection (in.)	Average Elastic Subgrade Deflection (in.)	Remarks	
			Longitudinal		Transverse		Diagonal		Max	Avg	Peak	Rolling				
			Max	Avg	Max	Avg	Max	Avg								
Lane 30																
1	0 2 passes	3.8 ↑	--	0.75	--	0.63	8.75	7.87	--	--	8.72	8.75	7.85	29.4	--	Item 1 failed at 2.4 coverages ( 2 passes)
2	0 2 passes	6.1 ↑	--	0.63	0.41	2.38	2.03	2.50	2.09	2.38	2.03	16.4	14.4	--	0.40	Item 2 failed at 28 coverages
	28	↑	0.50	0.44	6.50	5.35	6.50	5.56	6.50	5.35	5.35	16.8	13.4	2.20	0.50	
3	0 2 passes	10.0 ↑	--	--	--	--	--	--	--	--	--	--	--	0.40	0.10	Item 3 failed at 730 coverages
	28	↑	0.25	0.25	0.50	0.44	0.50	0.44	--	--	--	11.4	7.6	--	--	
	122	↑	0.50	0.31	0.63	0.47	0.50	0.38	--	--	--	15.8	9.6	--	--	
	243	10.0	0.50	0.38	0.75	0.63	0.75	0.63	0.50	0.44	--	--	--	0.38	0.15	
	365	↑	0.50	0.38	1.00	0.94	1.25	0.94	1.13	1.07	--	--	--	0.95	0.35	
	487	↑	0.25	0.25	2.75	2.13	3.00	2.18	2.25	1.75	10.0	7.6	--	0.68	0.20	
	608	↑	0.50	0.38	3.13	2.91	3.00	2.78	3.50	3.10	--	--	--	--	--	
	730	↑	0.75	0.47	2.75	2.60	2.70	2.50	2.13	1.88	--	--	--	0.88	0.35	
			0.88	0.56	3.38	3.19	3.25	3.15	3.00	2.50	11.2	7.3	--	0.40	0.30	
Lane 31																
1	0 3	4.2 ↑	--	0.50	0.34	5.50	4.90	6.50	5.10	4.50	4.37	--	--	2.70	0.90	Item 1 failed at 3 coverages
2	0 3	6.3 ↑	--	--	--	--	--	--	--	--	--	--	--	1.20	0.70	Item 2 failed at 26 coverages
	26	↑	0.38	0.31	3.00	2.56	2.50	2.18	3.00	2.56	--	--	--	0.90	0.40	
			1.50	1.06	7.00	5.87	7.00	6.12	3.50	3.06	--	--	--	0.70	0.40	
3	0 3	7.5 ↑	--	--	--	--	--	--	--	--	--	--	--	0.90	0.70	Item 3 failed at 40 coverages
	26	↑	0.38	0.28	1.25	1.15	1.25	1.09	1.25	1.15	--	--	--	0.70	0.30	
	40	↑	1.00	0.75	3.00	2.87	3.00	2.87	2.25	2.00	--	--	--	0.30	0.20	
			0.75	0.56	5.63	5.44	5.63	4.72	2.50	2.38	--	--	--	0.70	0.40	

Note: For lane 30, a 12-wheel (4 abreast, 3 in line) assembly loaded to 252 kips (21,000 lb per tire) was used for trafficking. For lane 31, a single-wheel assembly loaded to 21 kips was used. For both lanes, 20.00-20, 22-ply tires inflated to 100 psi were used.

TABLE 2  
SUMMARY OF CBR, DENSITY, AND WATER CONTENT DATA, TEST SECTION 14

Test Item*	No. of Traffic Coverages	Depth (in.)	CBR	Water Content (%)	Dry Density (lb/cu ft)	Remarks		
Lane 30								
1	0	0	3.9	29.4	90.3	Failed at 2.4 coverages (2 passes)		
		6	3.3	29.2	92.1			
		12	4.6	26.6	93.2			
		18	6.9	26.3	94.3			
	2	0	3.0	30.3	87.9			
		6	3.3	29.9	89.4			
		12	4.9	26.4	93.6			
	2	0	0	5.9	26.4		93.3	Failed at 28 coverages
			6	6.0	26.3		94.1	
12			7.0	26.5	94.4			
18			9.5	24.5	97.8			
23		0	5.4	26.9	94.6			
		6	5.5	25.8	94.4			
		12	7.0	26.2	95.8			
3		0	0	8.0	23.0	95.8	Failed at 730 coverages	
			6	10.5	23.8	94.9		
	12		12.0	24.7	95.6			
	18		9.0	23.0	95.0			
	600	0	12.0	22.1	103.4			
		6	8.0	21.8	99.7			
		12	10.0	24.3	97.6			
	Lane 31							
	1	0	0	4.4	28.5	89.8		Failed at 3 coverages
6			4.2	28.0	91.5			
12			5.2	29.3	89.1			
3		0	3.1	29.1	89.6			
		6	3.2	30.3	89.0			
		12	5.2	26.6	93.6			
2		0	0	5.7	26.3	93.5	Failed at 26 coverages	
			6	7.0	26.5	92.7		
	12		7.0	24.7	94.8			
	26	0	5.2	26.7	94.1			
		6	3.4	27.9	91.7			
		12	7.4	25.1	95.9			
	3	0	0	9.0	24.0	97.1		Failed at 40 coverages
			6	8.0	25.8	94.5		
12			8.0	21.1	88.6			
40		0	5.8	25.9	94.6			
		6	5.3	27.1	92.8			
		12	9.0	23.9	97.3			

\* Subgrade material was heavy clay (backshot; classified as CH) in all items. All items were unsurfaced.

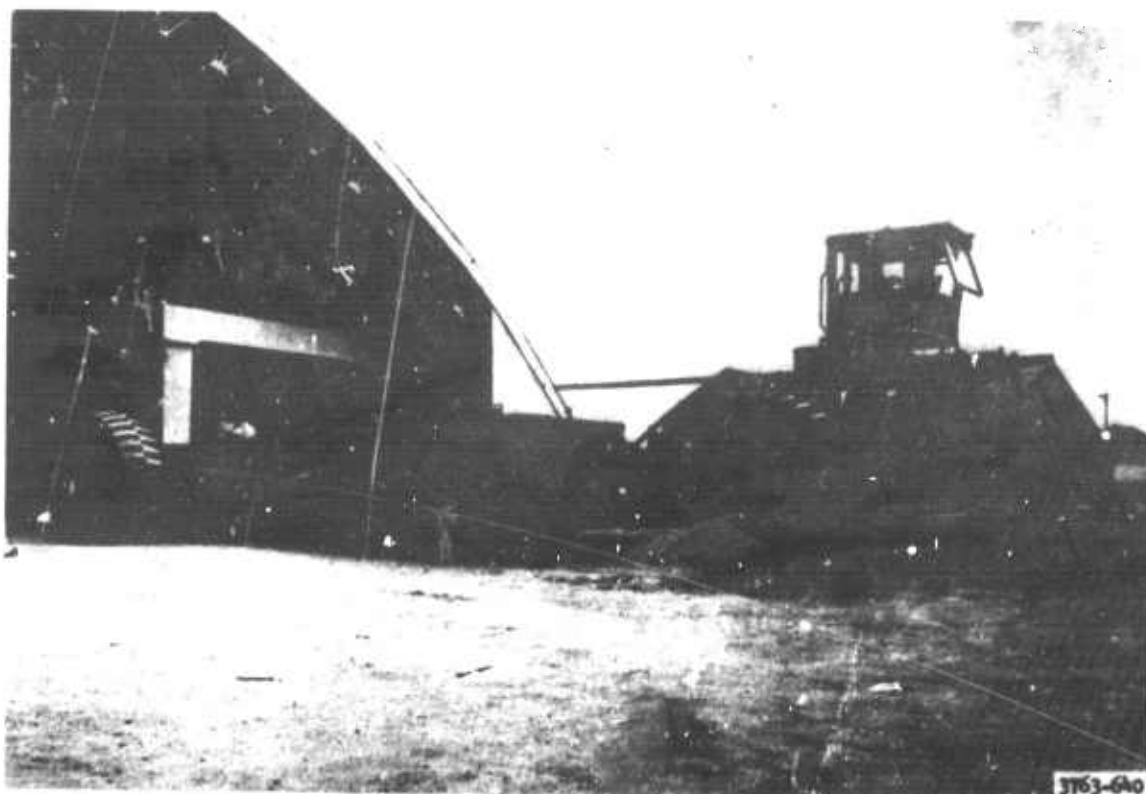


Figure 2. Test load vehicle used in trafficking lane 30



Figure 3. Test load vehicle used in trafficking lane 31

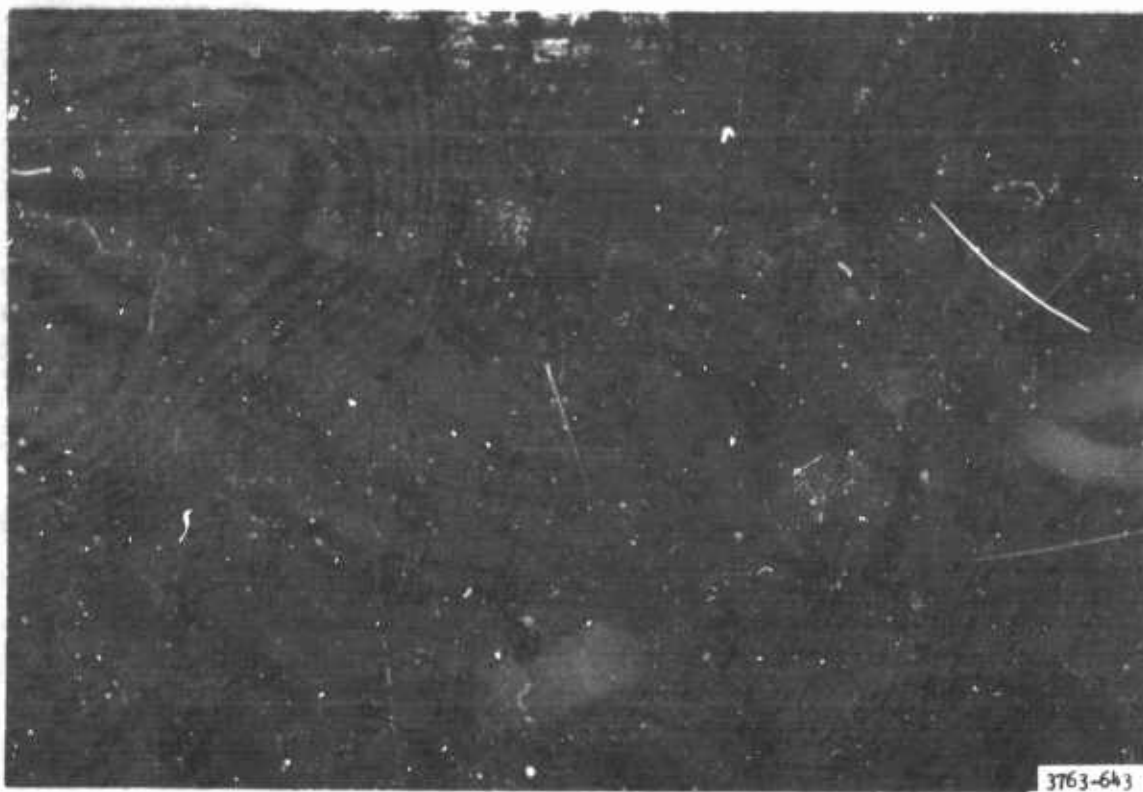


Figure 4. Lane 30, item 1, prior to traffic

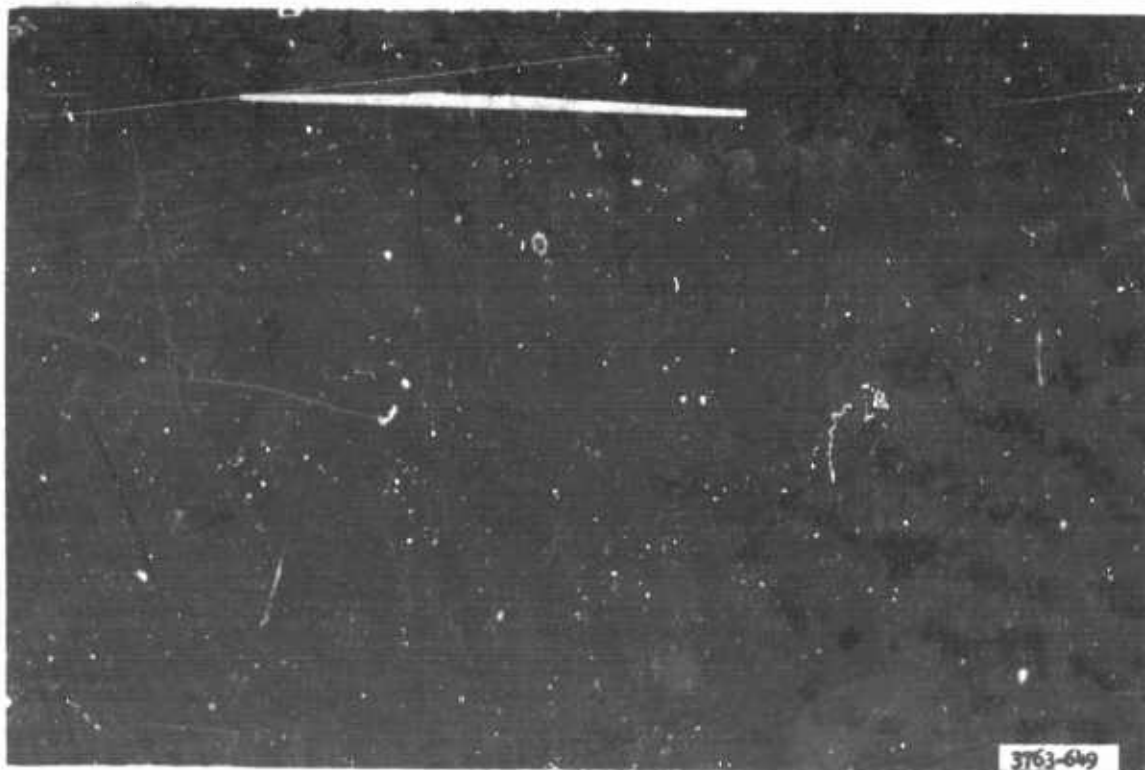


Figure 5. Lane 30, item 1. Transverse straightedge shows rutting at 2.4 coverages (2 passes) (failure)



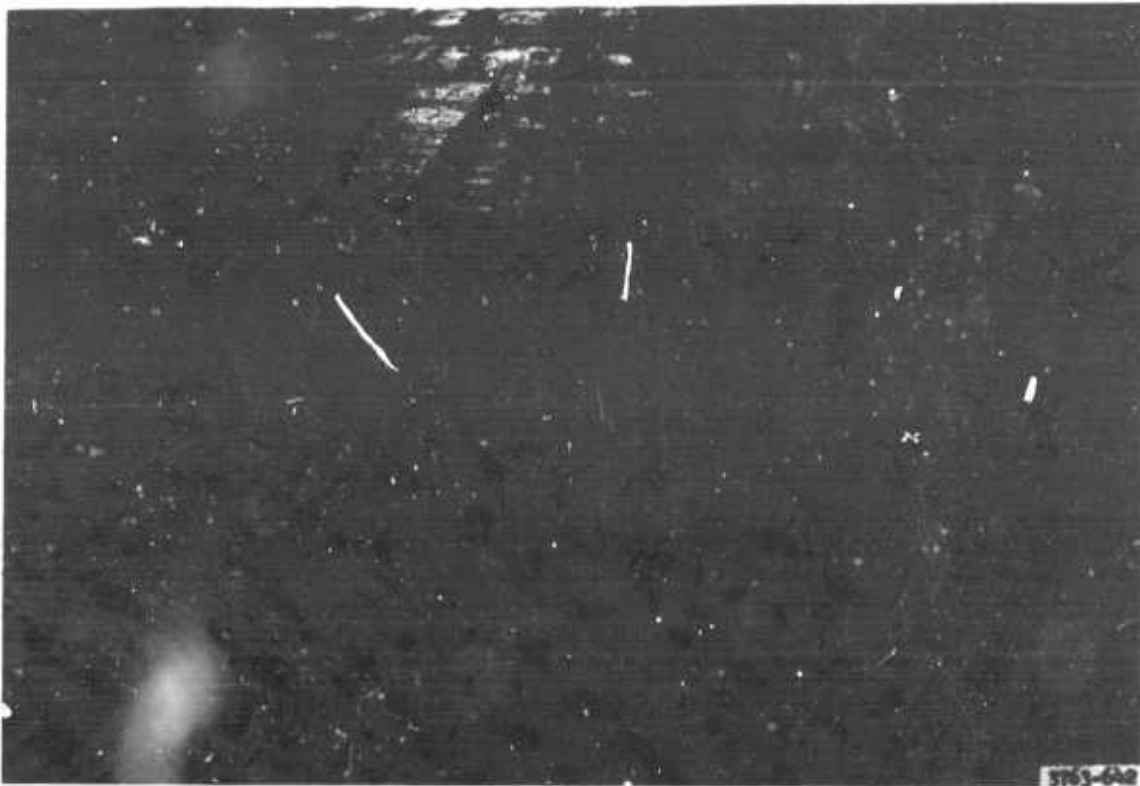


Figure 6. Lane 30, item 2, prior to traffic

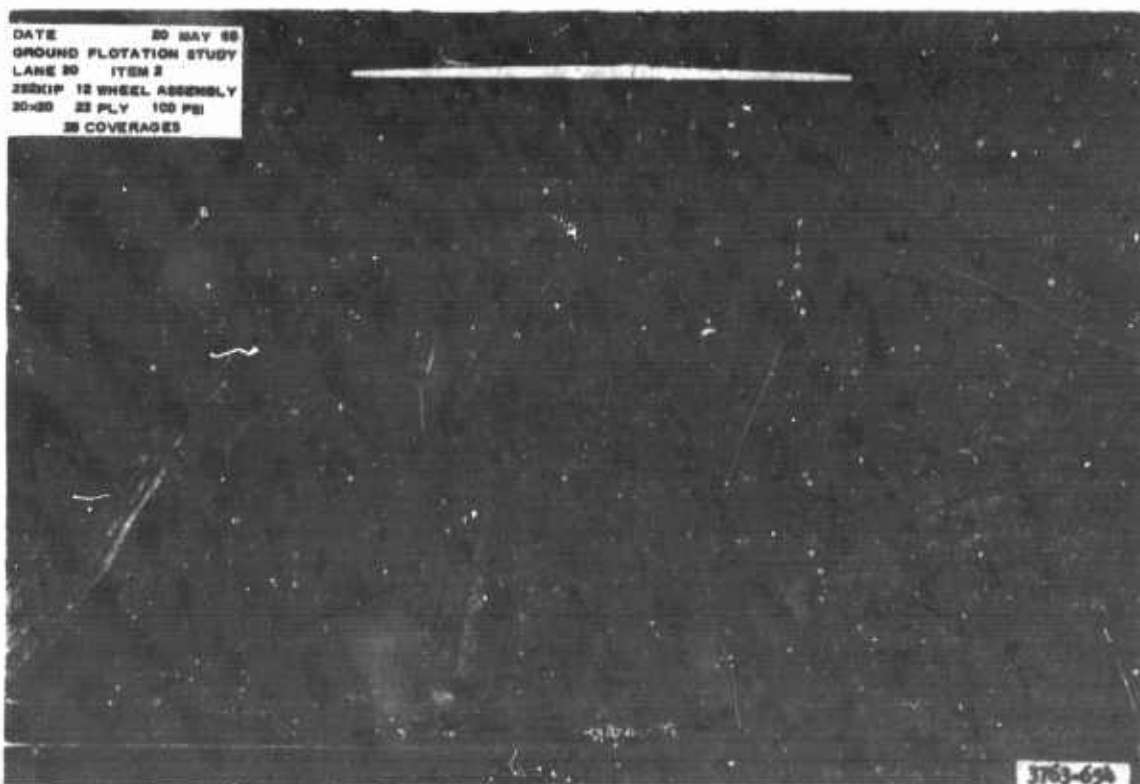


Figure 7. Lane 30, item 2. Transverse straightedge shows roughness at 28 coverages (failure)



Figure 8. Lane 30, item 3, prior to traffic

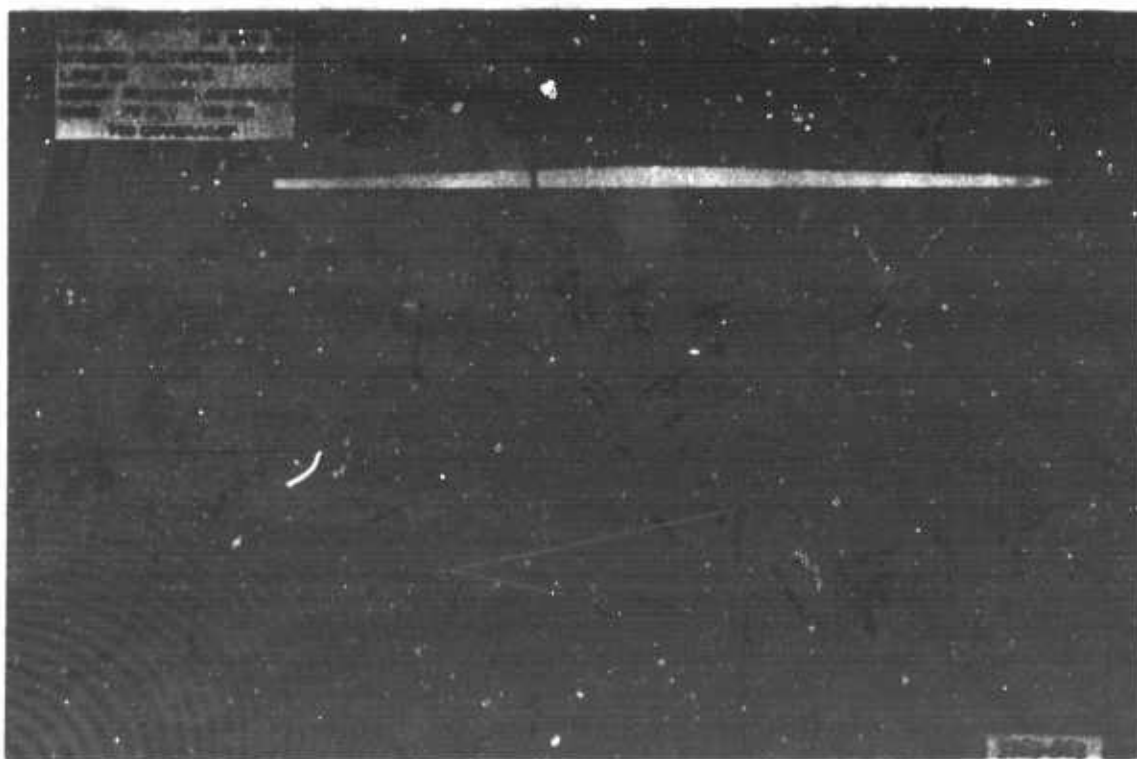


Figure 9. Lane 30, item 3. Transverse straightedge shows roughness at 730 coverages (failure)



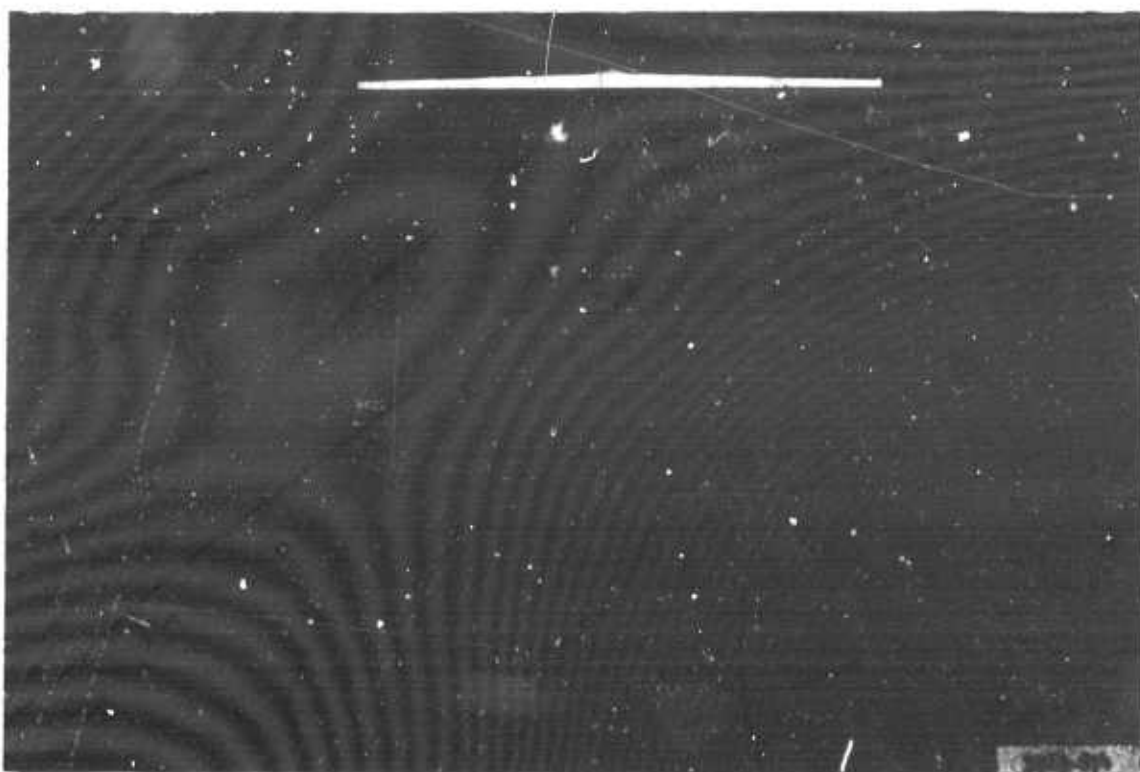


Figure 10. Lane 31, item 1. Transverse straightedge shows roughness at 3 coverages (failure)



Figure 11. Lane 31, item 2. Transverse straightedge shows roughness at 26 coverages (failure)

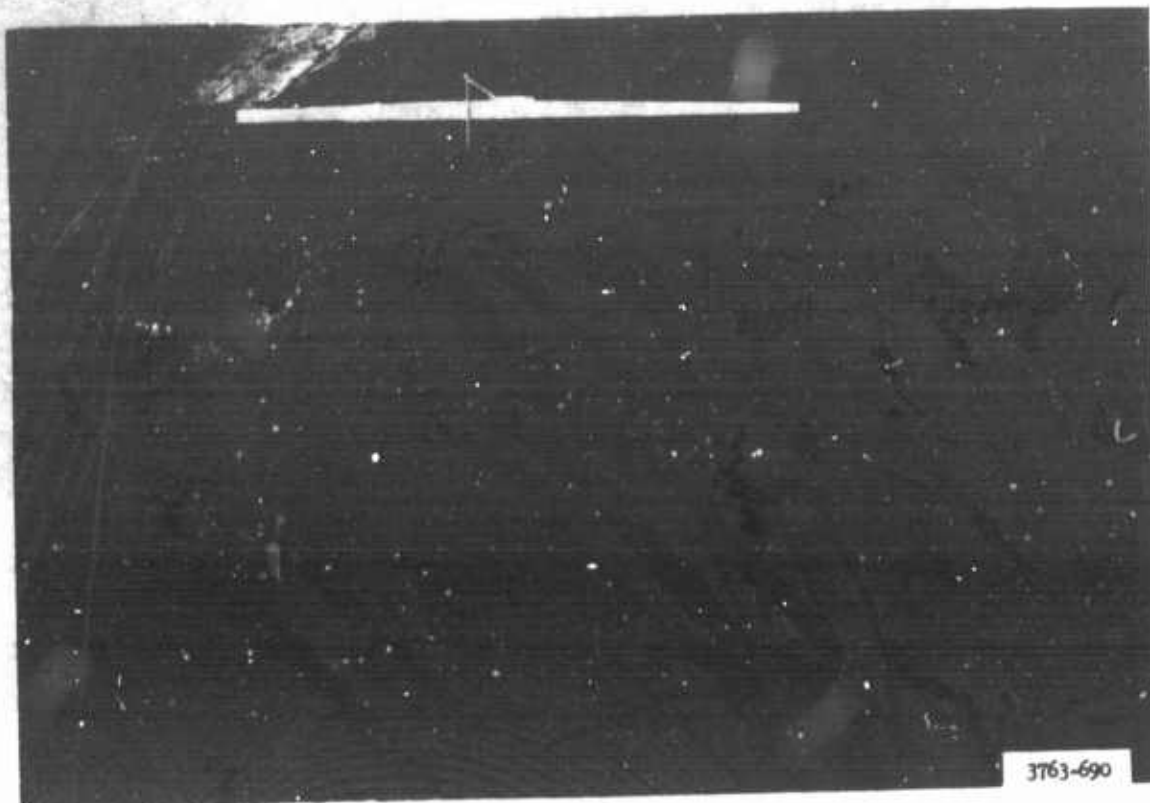


Figure 12. Lane 31, item 3. Transverse straightedge shows roughness at 40 coverages (failure)

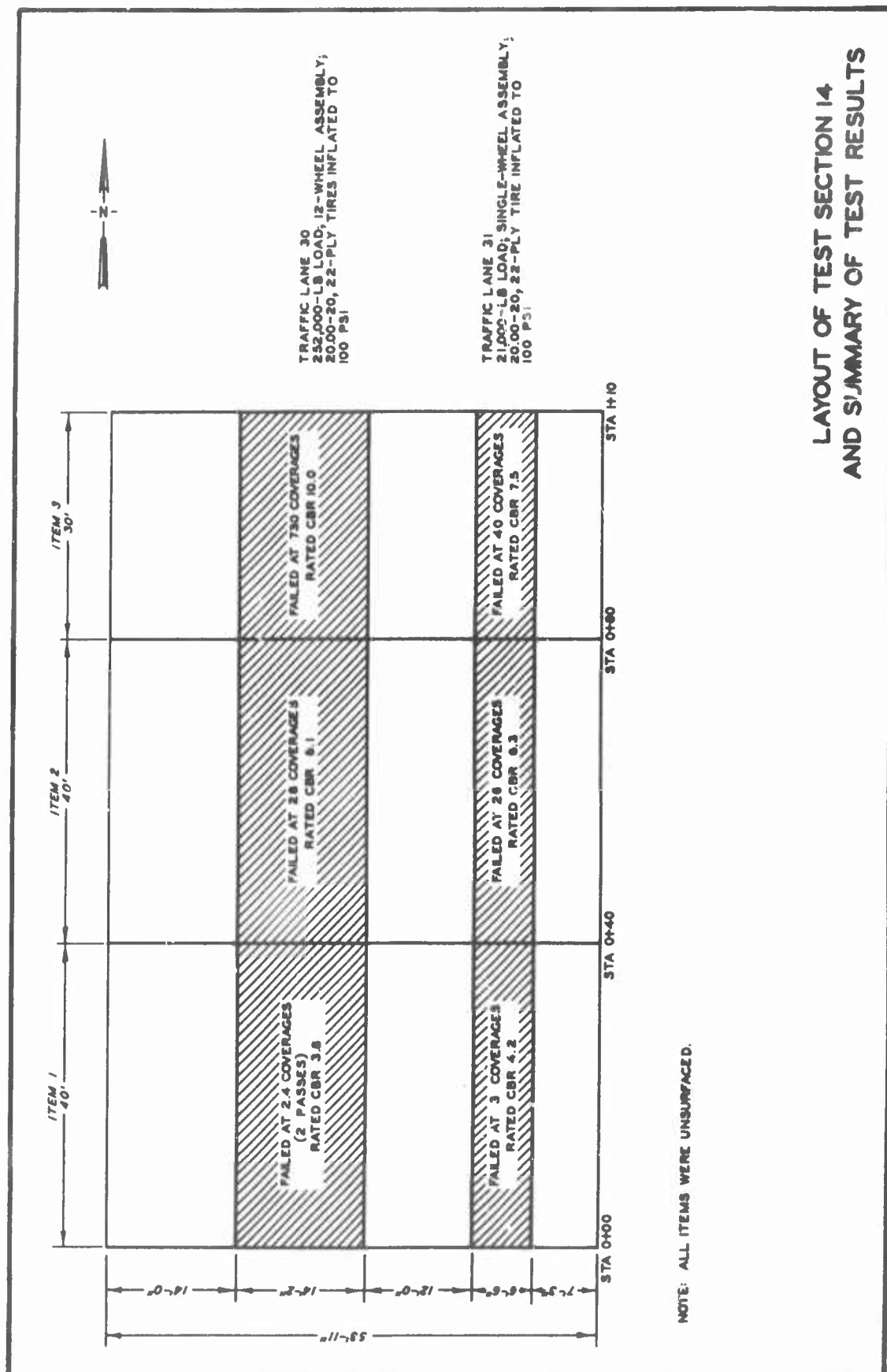


Figure 13

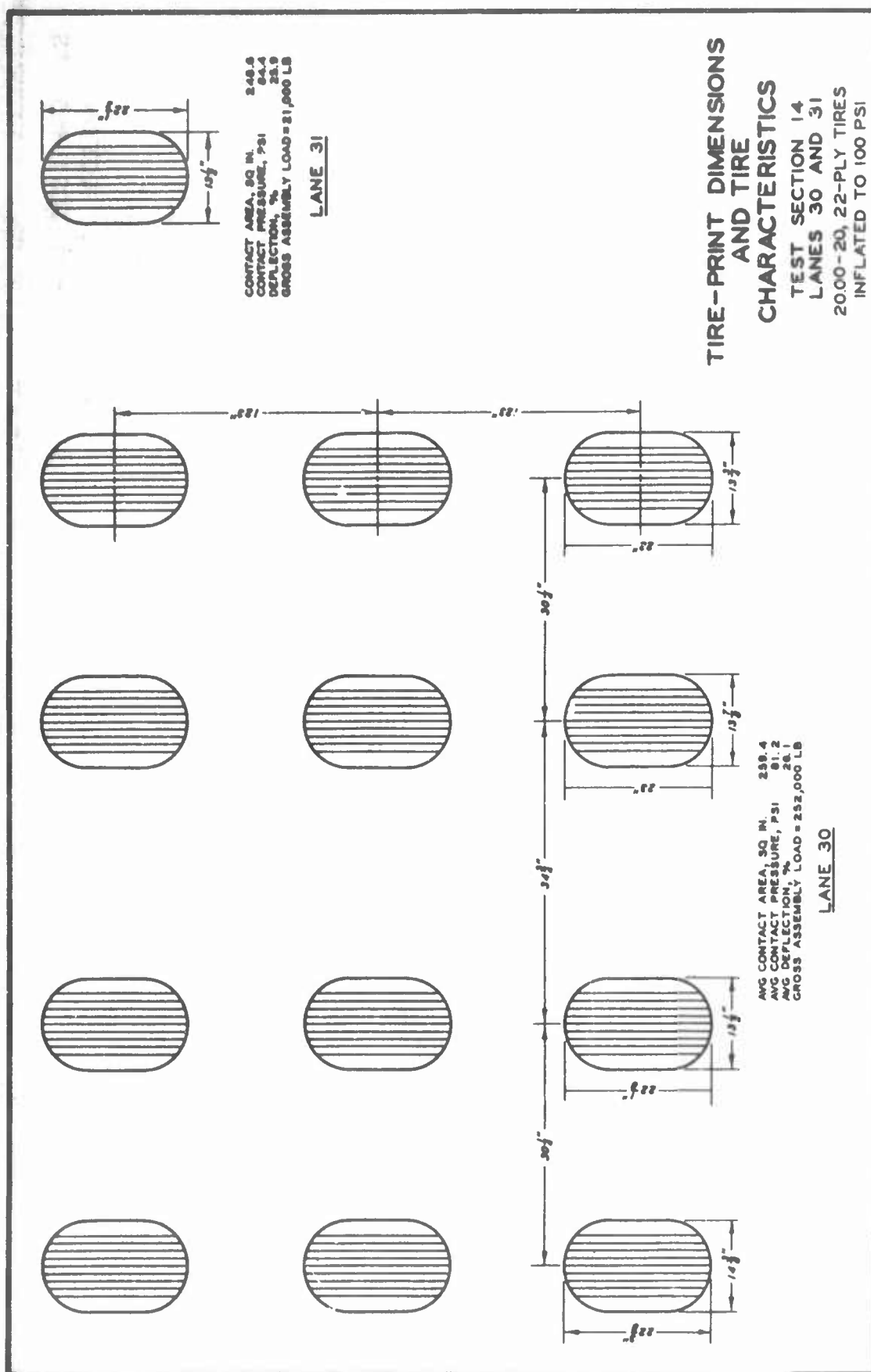


Figure 14



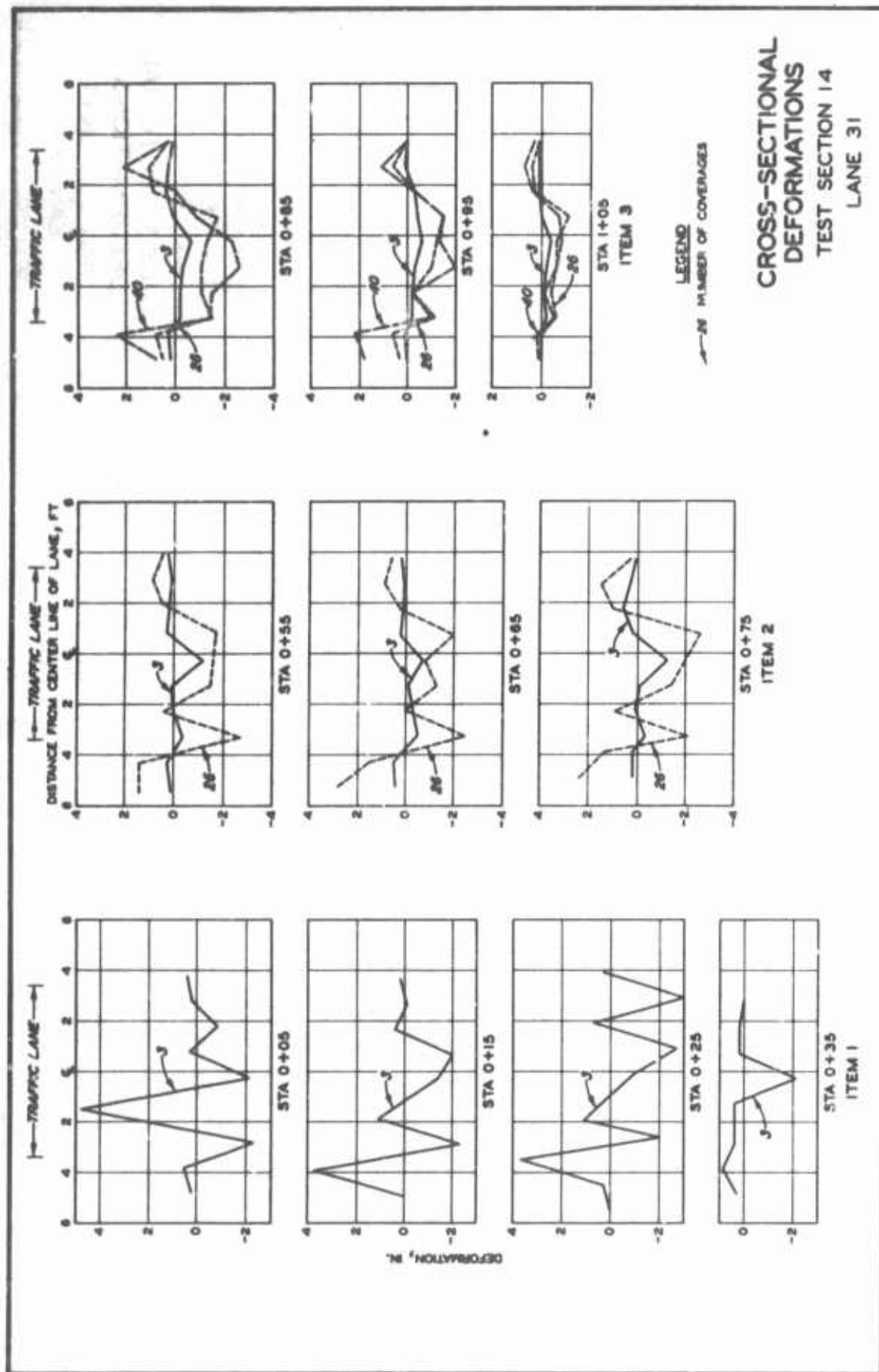


Figure 16

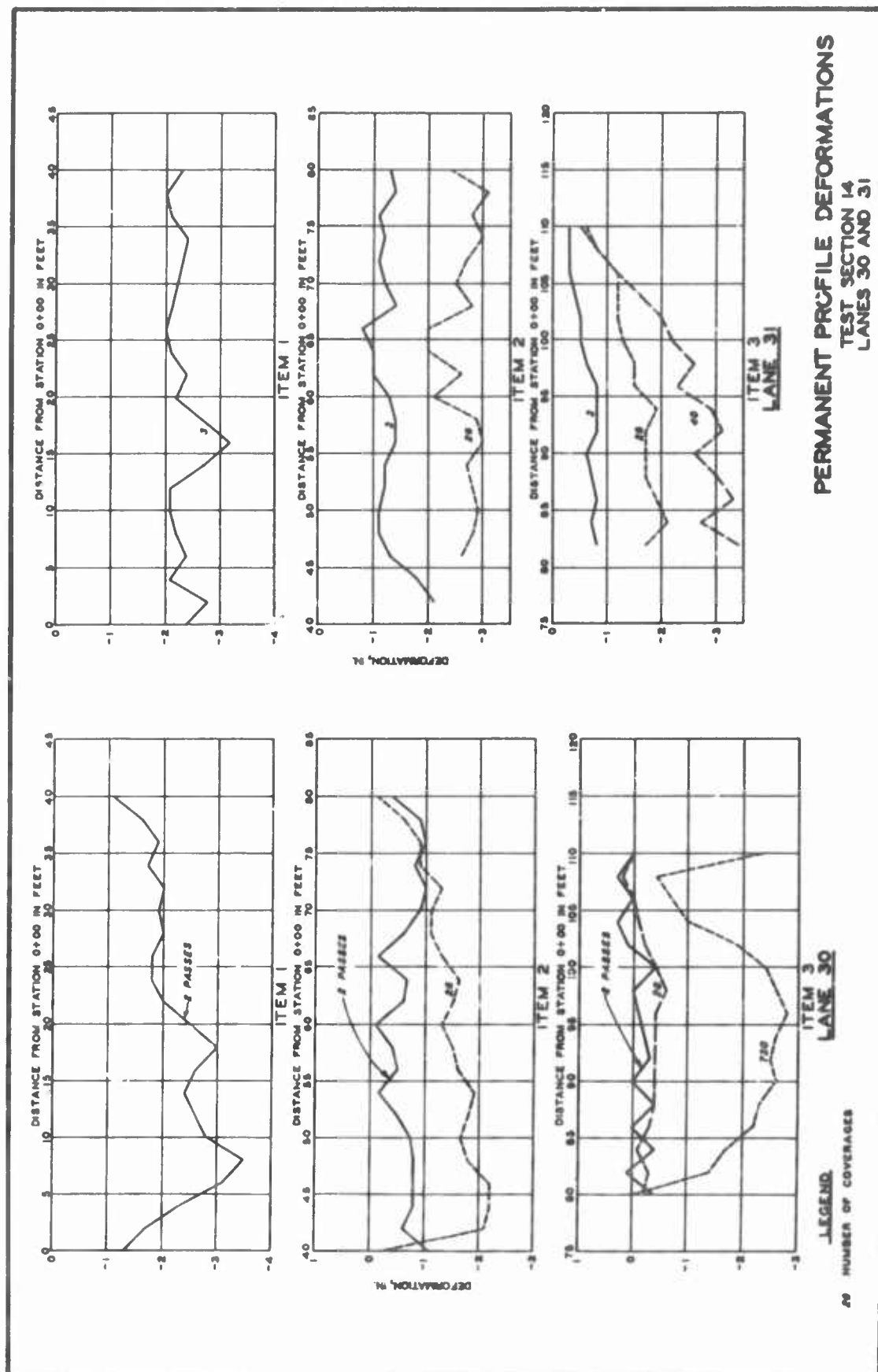


Figure 17

UNCLASSIFIED

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1. ORIGINATING ACTIVITY (Corporate author) <b>U. S. Army Engineer Waterways Experiment Station</b>		2a. REPORT SECURITY CLASSIFICATION <b>UNCLASSIFIED</b>	
		2b. GROUP	
3. REPORT TITLE <b>Aircraft Ground-Flotation Investigation Part XIV Data Report on Test Section 14</b>			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) <b>Final Technical Report</b>			
5. AUTHOR(S) (Last name, first name, initial) <b>Hammitt, G. M., II. Watkins, J. B.</b>			
6. REPORT DATE <b>September 1966</b>		7a. TOTAL NO. OF PAGES <b>23</b>	7b. NO. OF REFS
8a. CONTRACT OR GRANT NO. <b>MIPR AS-4-177</b>		8a. ORIGINATOR'S REPORT NUMBER(S) <b>AFFDL-IR-66-43, Part XIV.</b>	
8b. PROJECT NO. <b>410A</b>		8b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) <b>None</b>	
10. AVAILABILITY/LIMITATION NOTICES <b>This document is subject to special export con- trols and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Air Force Flight Dynamics Laboratory (EDRM), Wright-Patterson AFB, Ohio 45433.</b>			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY <b>Air Force Flight Dynamics Laboratory Research and Technology Division AF Systems Command, WPAFB, Ohio</b>	
13. ABSTRACT  <b>This data report describes the results of work undertaken as part of an overall program to develop ground-flotation criteria for the C-5A aircraft.</b>			

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
<b>Aircraft Ground Flotation</b> <b>Rolling Resistance</b> <b>Rear Area Airfields</b> <b>Support Area Airfields</b> <b>Forward Area Airfields</b> <b>Vehicle Mobility</b>						

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**SUPPLEMENTARY**

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13 MARCH 1967

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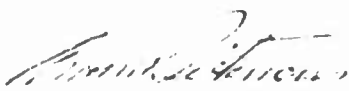
The investigation described herein constitutes one phase of studies conducted during 1964 and 1965 at the U. S. Army Engineer Waterways Experiment Station (WES) under U. S. Air Force Project No. 410-A, MIPR No. AS-4-177, "Development of Landing Gear Design Criteria for the CX-HLS Aircraft." (The CX-HLS is now designated C-5A.) This program was sponsored and directed by the Landing Gear Group, Air Force Flight Dynamics Laboratory, Research and Technology Division, Mr. R. J. Parker, Project Engineer.

These tests were conducted by personnel of the WES Flexible Pavement Branch, Soils Division, under the general supervision of Messrs. W. J. Turnbull, A. A. Maxwell, and R. G. Ahlvin, and the direct supervision of Mr. D. N. Brown. Other personnel actively engaged in this study were Messrs. C. D. Burns, D. M. Ladd, W. N. Brabston, H. H. Ulery, Jr., A. J. Smit' Jr., W. J. Hill, Jr., J. B. Watkins, and G. M. Hammitt II. This report was prepared by Messrs. Watkins and Hammitt.

Directors of WES during the conduct of this investigation and preparation of this report were Col. Alex G. Sutton, Jr., CE, and Col. John R. Oswalt, Jr., CE. Technical Director was Mr. J. B. Tiffany.

Publication of this technical documentary report does not constitute Air Force approval of the report's findings or conclusions. It is published only for the exchange and stimulation of ideas.

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